Chapter XV
The Agent Object Relationship Simulation as a Business Process

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ABSTRACT

The use of agent-based simulation models is growing and attracted a lot of attention recently both for researchers and business management. Agent-Object Relationship (AOR) is an agent-based simulation paradigm that uses reaction rules to model agents' behavior. The goal of this chapter, besides exemplifying the AOR concepts by means of a use case, is to investigate the use of business process modeling notation (BPMN) to model the AOR simulation process. Moreover it discusses aspects of a distributed architecture for an AOR simulation system. The chapter concludes with the fact that BPMN is well suited to model the AOR simulation process.

INTRODUCTION

This chapter has two main pillars on which it stands on: agent-based simulation and modeling and business process modeling. The use of agent-based simulation models is growing and attracted a lot of attention recently both for researchers and business management. Business process modeling is on an ascending curve of interest and research.

This chapter tries to bind together these major paradigms of nowadays research efforts, agent based simulation modeling and business process modeling.

The Agent-Object-Relationship (AOR), an agent based simulation paradigm, is used to illustrate the agent based simulation concepts.

AOR employs the concept of reaction rules for modeling behavior of organization information systems. AOR provides an agent based simulation platform based on a high level ontological meta-model and offers compared to other simulation platforms almost a complete list of features specific to agent based simulation systems: it is independent from a specific programming language, it is model driven, uses rule based (declarative) behavior modeling, supports a concept of space, supports the distinction between objects and agents, includes a cognitive model of perceptions, supports the distinction between facts and beliefs.

The chapter starts with an overview of AOR paradigm. The use case that follows the AOR overview illustrates the AOR concepts and also exemplifies the AOR modeling capabilities. The AOR simulation principles are then narrated and explained. The cornerstone of the chapter is the introduction of a distributed architecture for AOR and the modeling as a business process of the AOR simulation process. The modeling as a business process is a starting point for future research that includes modeling of agent behavior as business processes using BPMN notation.

RELATED WORK

Before going into the middle of the problem it is not with out reason to have a short look over the main topic of the current chapter.

Nowadays agents are encountered almost every where, or at least the term agent. There are several types of agents: intelligent agents, information agents, mobile agents, personal assistant agents and other types of agents.

It is claimed that agent technologies facilitate software development based on their interaction's high level of abstractions.

There might be raised several possible questions such: What is an agent? Do agents have something in common? And so on.

In Russell & Norvig, 1995 it is argued that agents are entities perceiving their environment through sensors and acting upon that environment through effectors. Agents are not isolated entities but they are able to communicate and collaborate with other entities. There are several group efforts towards the standardization of multi agents systems such as: Foundation for intelligent Physical Agents (FIPA), the Object Management Group, the Knowledge-able Agent-oriented System (KAoS).

The Multi Agents Systems (MAS) have generated many works and many systems were implemented in order to put in practice theory behind MAS. MAS' base concepts are introduced in Wooldridge, 2000.

Bradshaw, 1997 presents a list of common agent attributes:

- **Adaptivity:** Being able to learn and improve with experience
- **Autonomy:** Goal oriented, proactive and self-starting behavior
- **Collaborative behavior:** Working together with other agents to achieve common goal
- **Inferential Capability:** The ability to act on abstract task specification using prior knowledge of general goals
- **"Knowledge-level" communication ability:** The ability to communicate with other agents
- **Mobility:** Being able to migrate in a self oriented way from one host platform to another
- **Personality:** The capability of manifesting the attributes of a believable character
- **Reactivity:** Ability to sense and act selectively

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